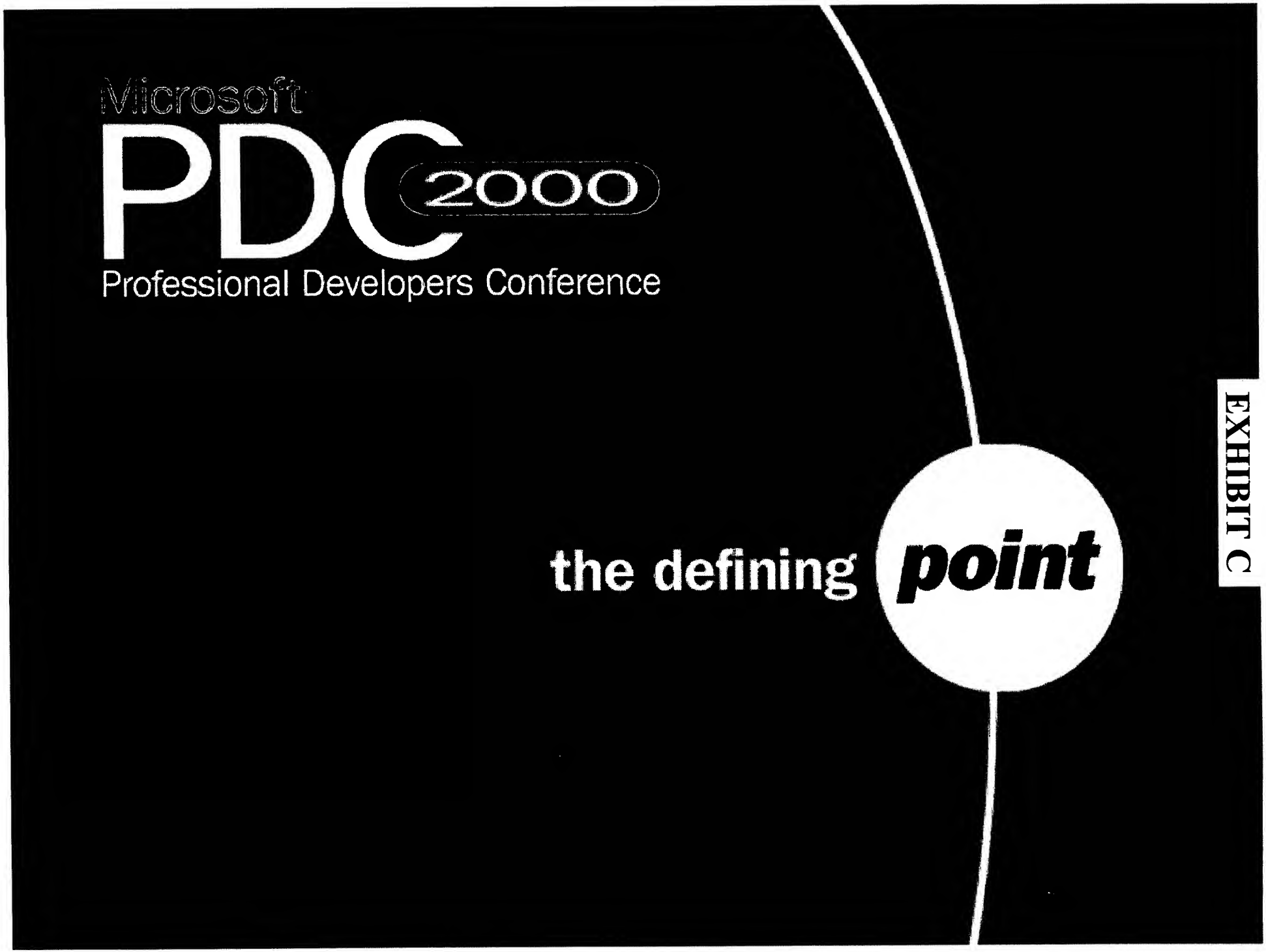

EXHIBIT C

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Application Center 2000:
Ensuring Reliability/Availability of Web and Component Applications

Justin Grant
Lead Program Manager
Application Center

Agenda...

- Application Center 2000 overview
- Distributed Application Monitoring
- WMI: the infrastructure of management of Windows DNA and .NET
- Managing and guaranteeing application availability with Application Center
  - Performance Management
  - Event Management
  - Health Monitor for automated "lights-out" recovery from application or system failures

Scale-Out

- Software scale-out model works
  - Cost-effective using commodity hardware
  - Scalable by adding more servers
  - Highly reliable
- But...
  - Ongoing operational costs
  - Difficult to deploy apps
  - Difficult to monitor apps for proactive management
  - Difficult to test apps
- Application Center 2000:
  Lower cost & complexity of scale out

AC 2000: Functional Overview

- Simple *Application* Management
  - Single application image
  - Deployment and synchronization
- Software Scaling Made Easy
  - On-demand scalability
  - Integrated load balancing management
- Mission-Critical Availability
  - No single point of failure
  - Performance and health monitoring

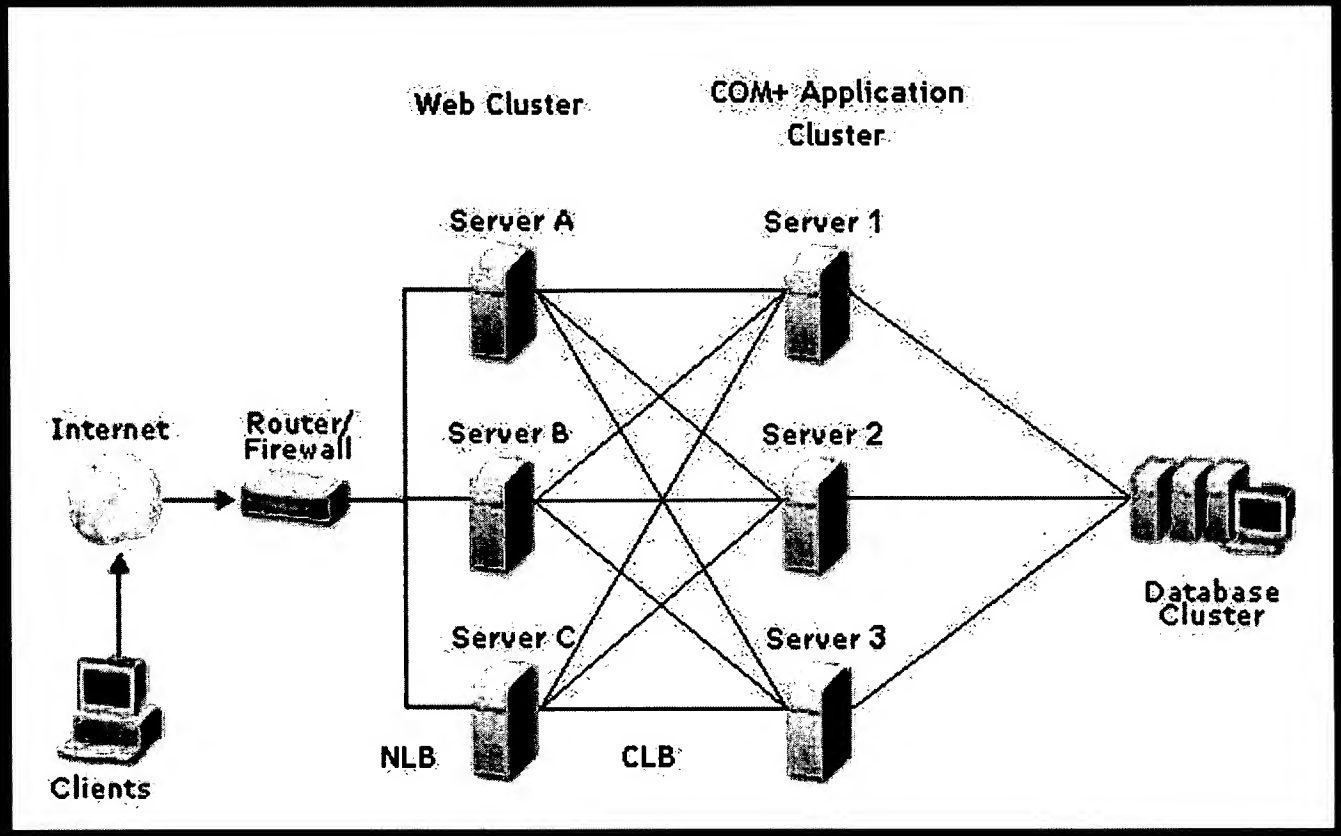
Platform Support

- WinDNA 2000
  - Win2K Server, Advanced, DataCenter
  - IIS 5, Active Server Pages (ASP)
  - COM+ 1.0
  - WMI
- .NET
  - Load Balancing for Web Services, ASP+ integrated with application-level monitoring
  - Richer instrumentation of .NET framework
  - Easier instrumentation of .NET applications
  - More integration with Application Center

Application Center Scenarios

- .COM's
- Hosting Providers & ASP's
- Intranet
- Web Services

Application Center Topology



web + biz-logic + data

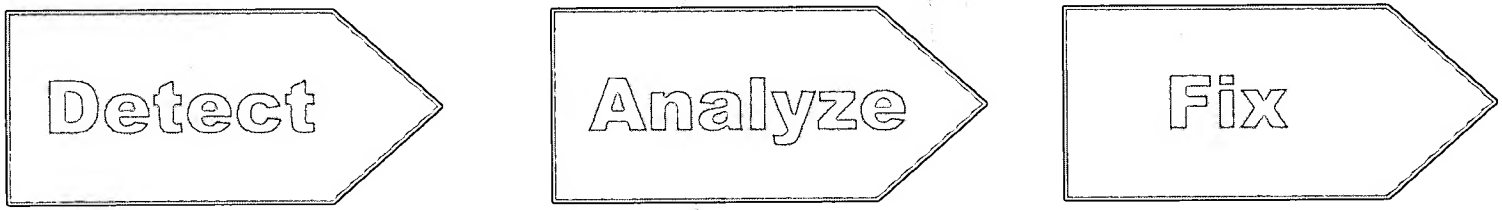
tier tier tier

Application Center 2000: High-Availability Architecture

- "Shared Nothing" clusters
  - No single point of failure
  - Application availability not affected if Cluster Controller fails
  - Fault-tolerant load balancing protects users from server or application failures
- Local Monitoring
  - Every server monitors itself
  - If critical failure detected, server can remove itself from load balancing
- Remote Monitoring
  - Rich application-level (HTTP,TCP/IP,etc.) and network level (ICMP,SNMP,etc.) remote monitoring

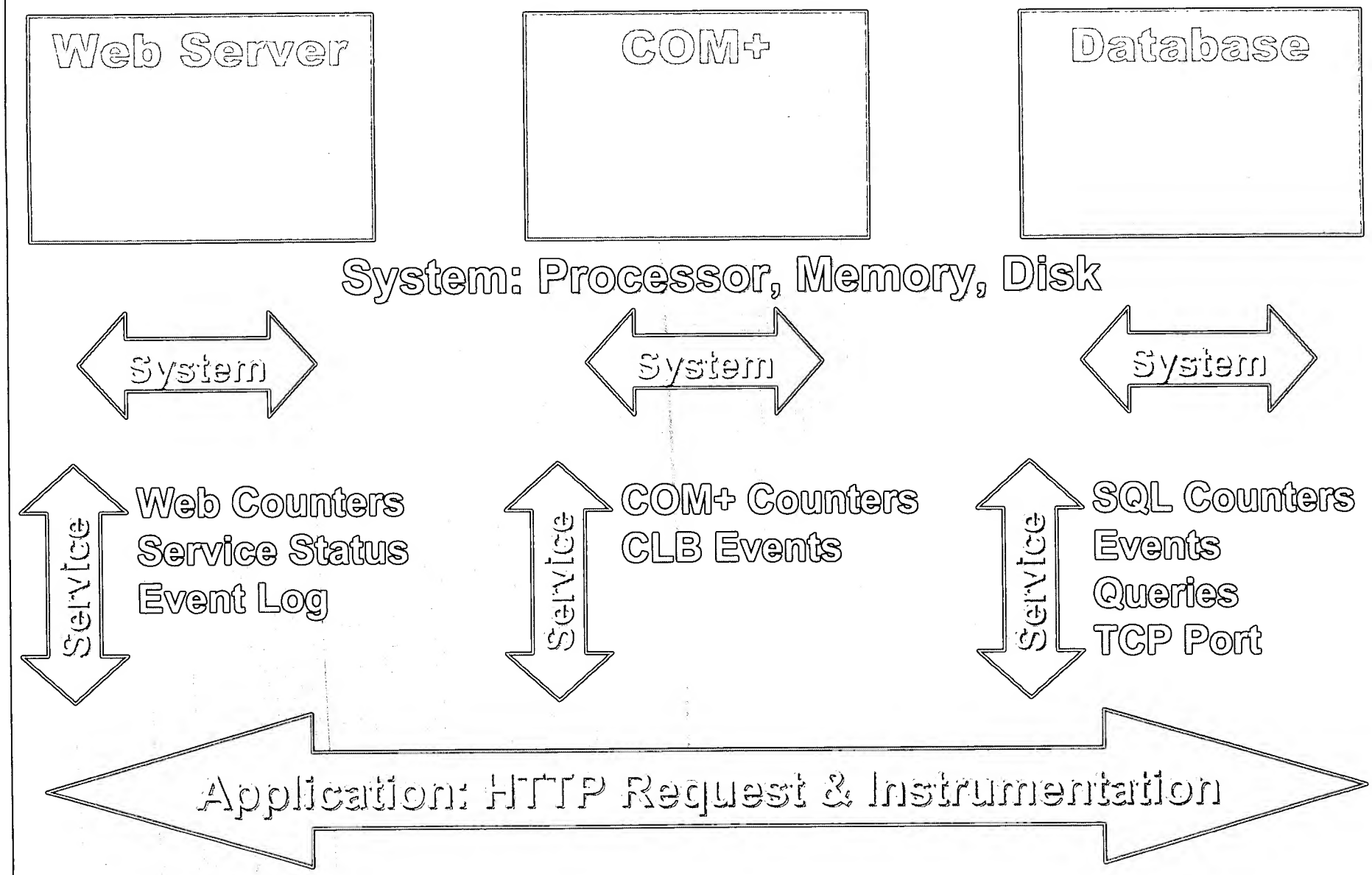
Monitoring For Availability

Goal: Customers can access your site

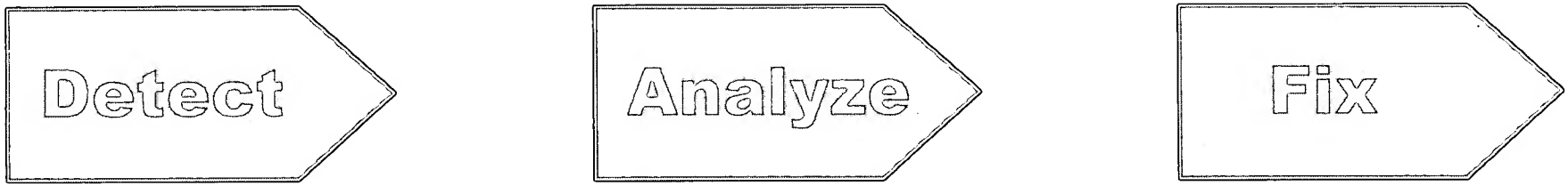


WMI + Application Center

Monitoring Health

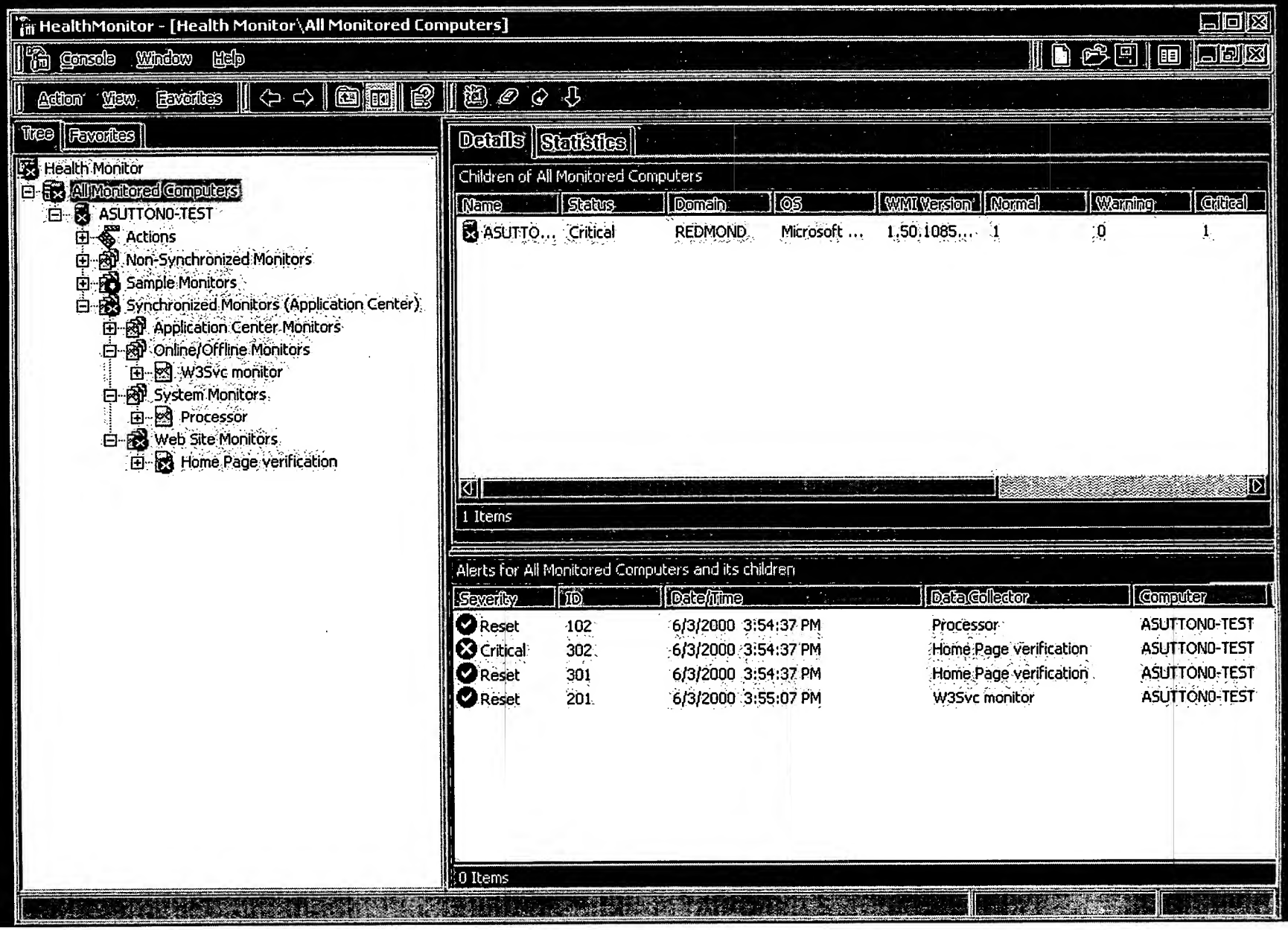


Demo: System Health



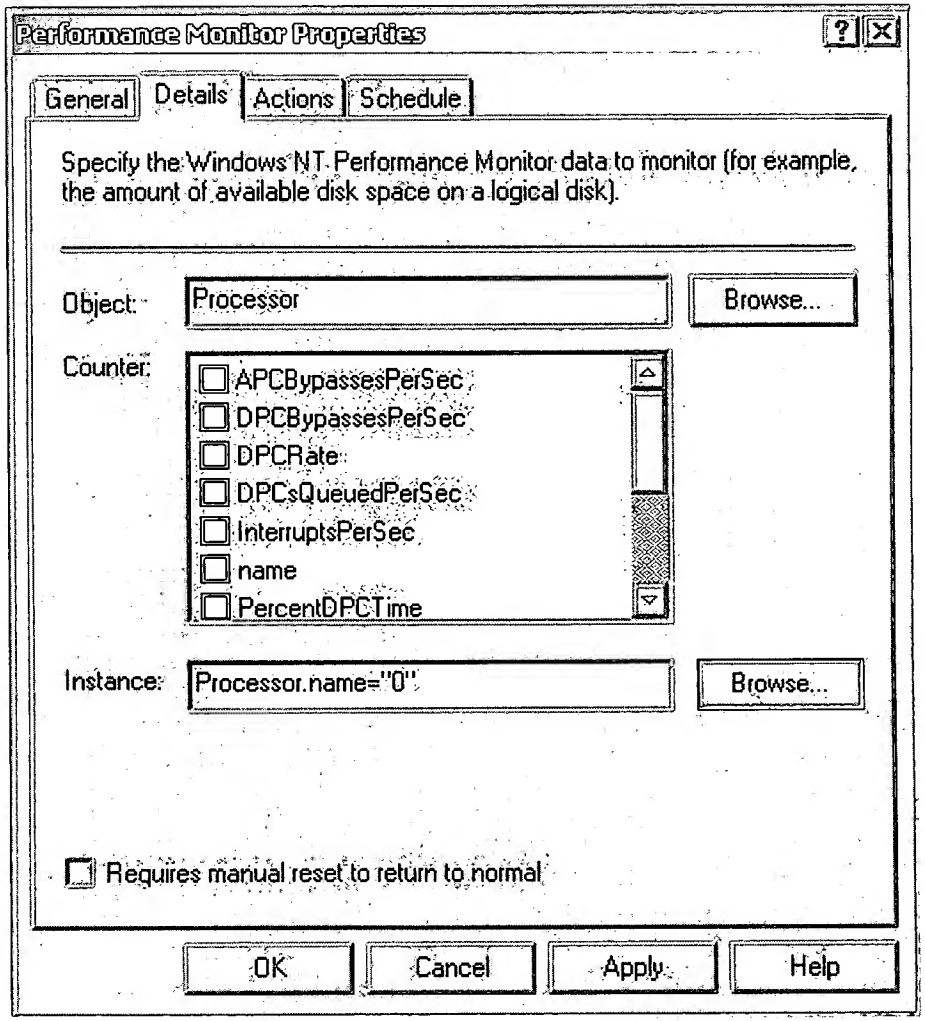
- Create monitor for CPU overload
- Associate action
- Generate CPU load
- Health Monitor console
- E-mail to administrator

Using Health Monitor



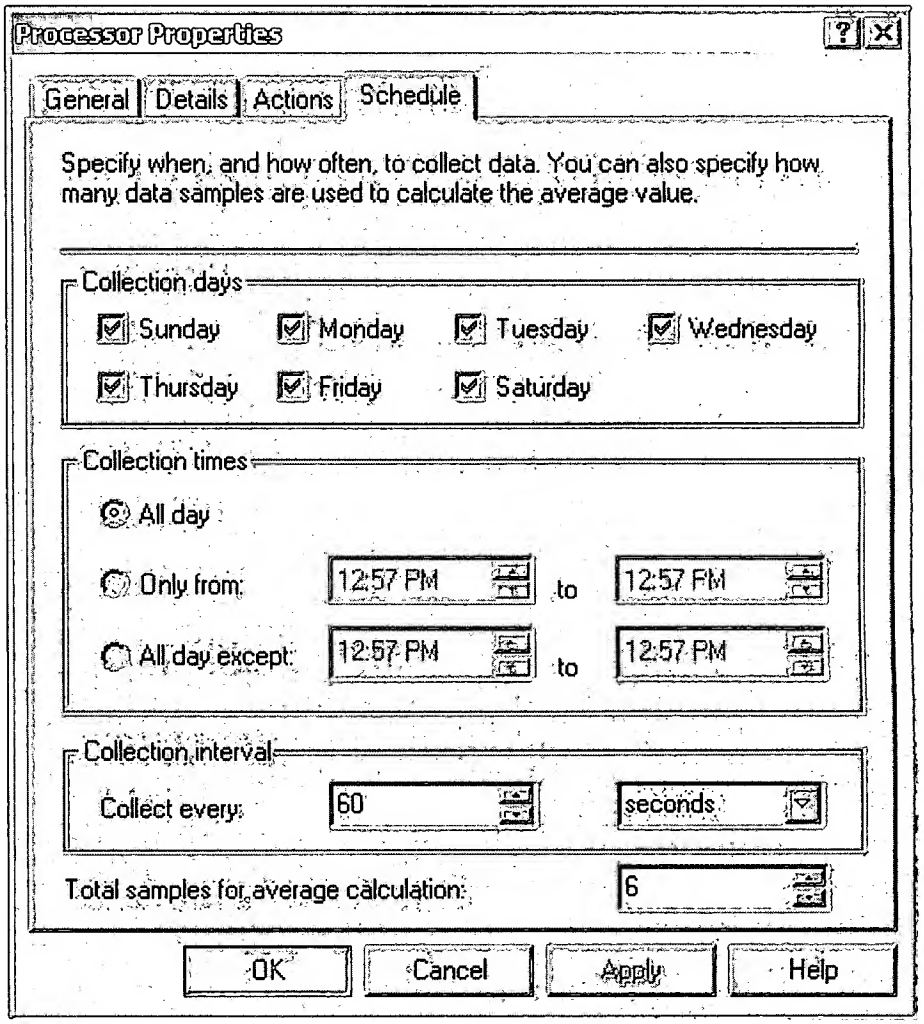
Data Collectors

- Perf counter
- Event Log
- Service/Process
- COM+ Application
- HTTP requests
- File or Directory
- Ping
- TCP/IP port connect
- WMI instance, event and data queries



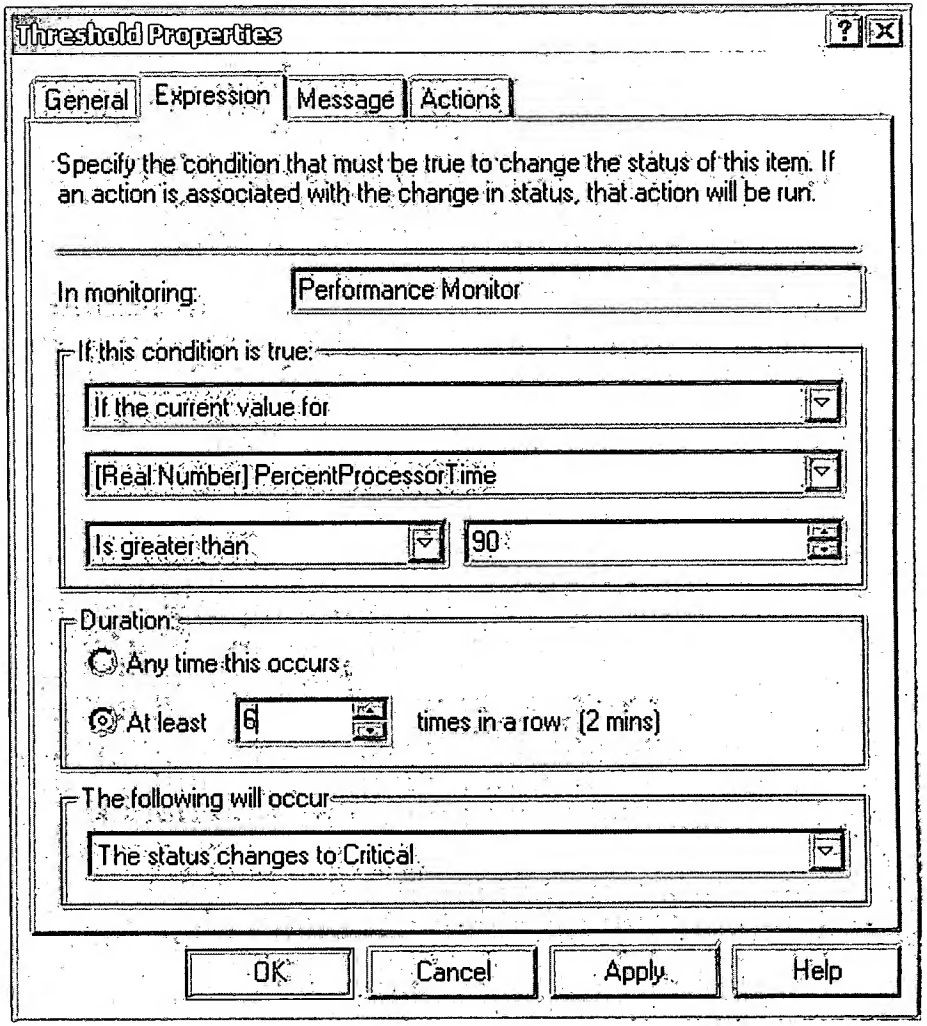
Schedule

- Collection Times
- Interval
- Average



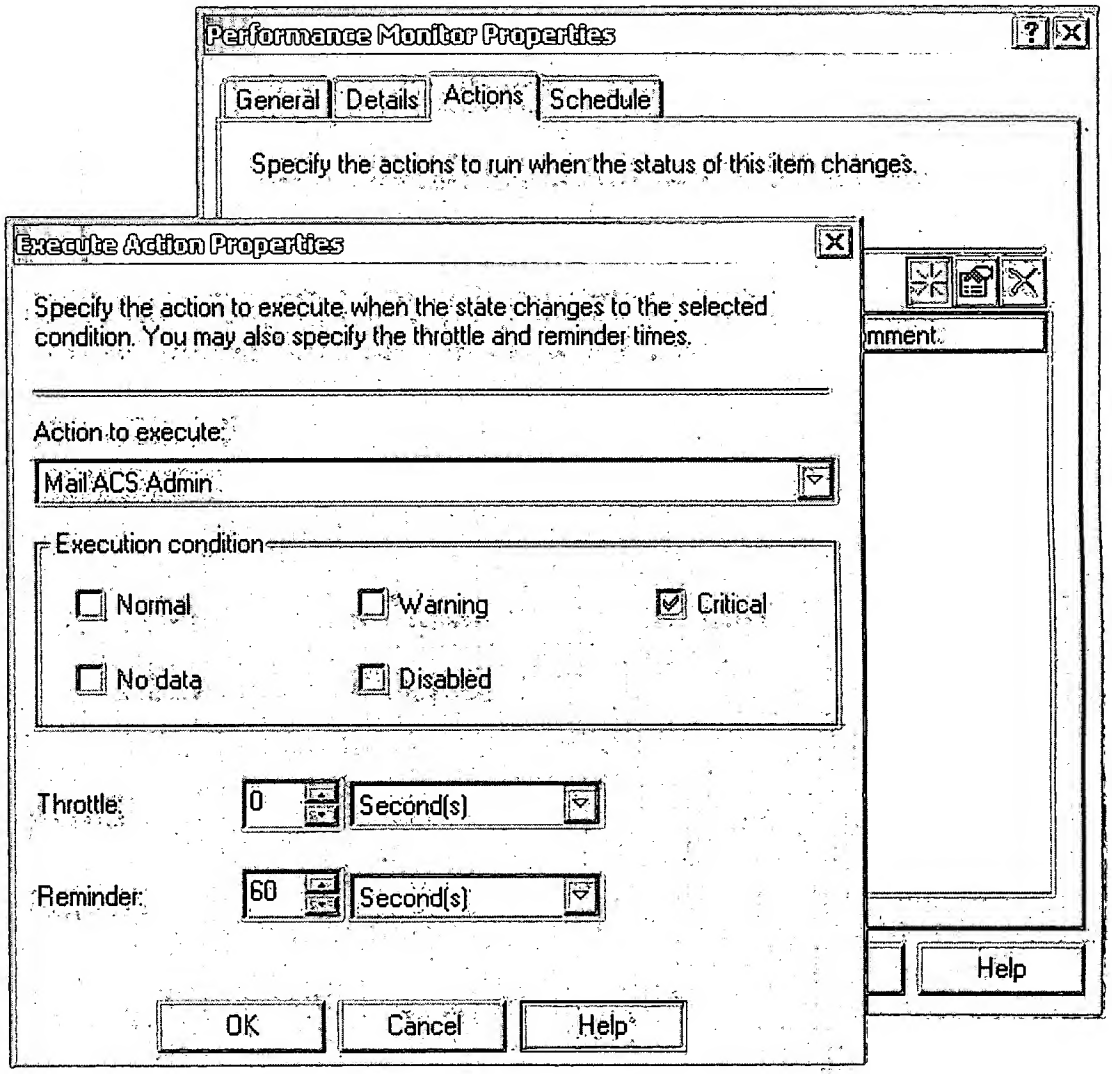
Thresholds

- Single property
- Current value, average, change
- Single or multiple occurrences
- State change
- Fires WMI Event

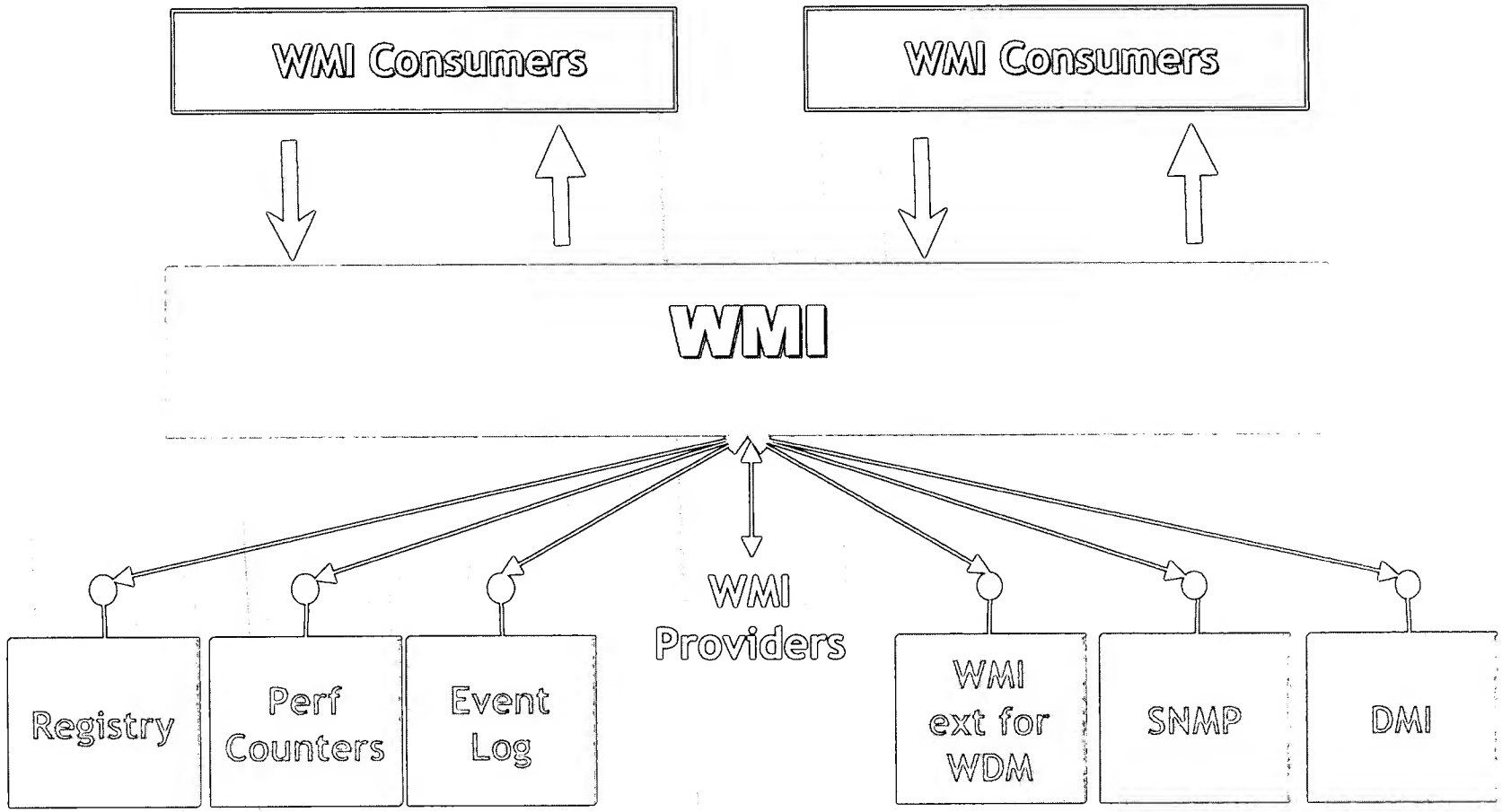


Actions

- E-Mail
- Text log
- Windows log
- Command line
- Script



WMI Overview



WMI Queries

All CIM objects are queryable

```
IWbemServices::ExecQuery
    ("select * from Win32LogicalDisk
          where Win32LogicalDisk.FreeSpace < 2000000")
```

SQL subset w/ new terms

Extensions for Discovery/Traversal of Schema relationships

```
IWbemServices::ExecQuery
    ("Associators of  {Win32_Service = 'DHCP'})
```

Event filtering (thresholds, aggregation, inheritance)

within XXX – for specifying the tolerance for event delay

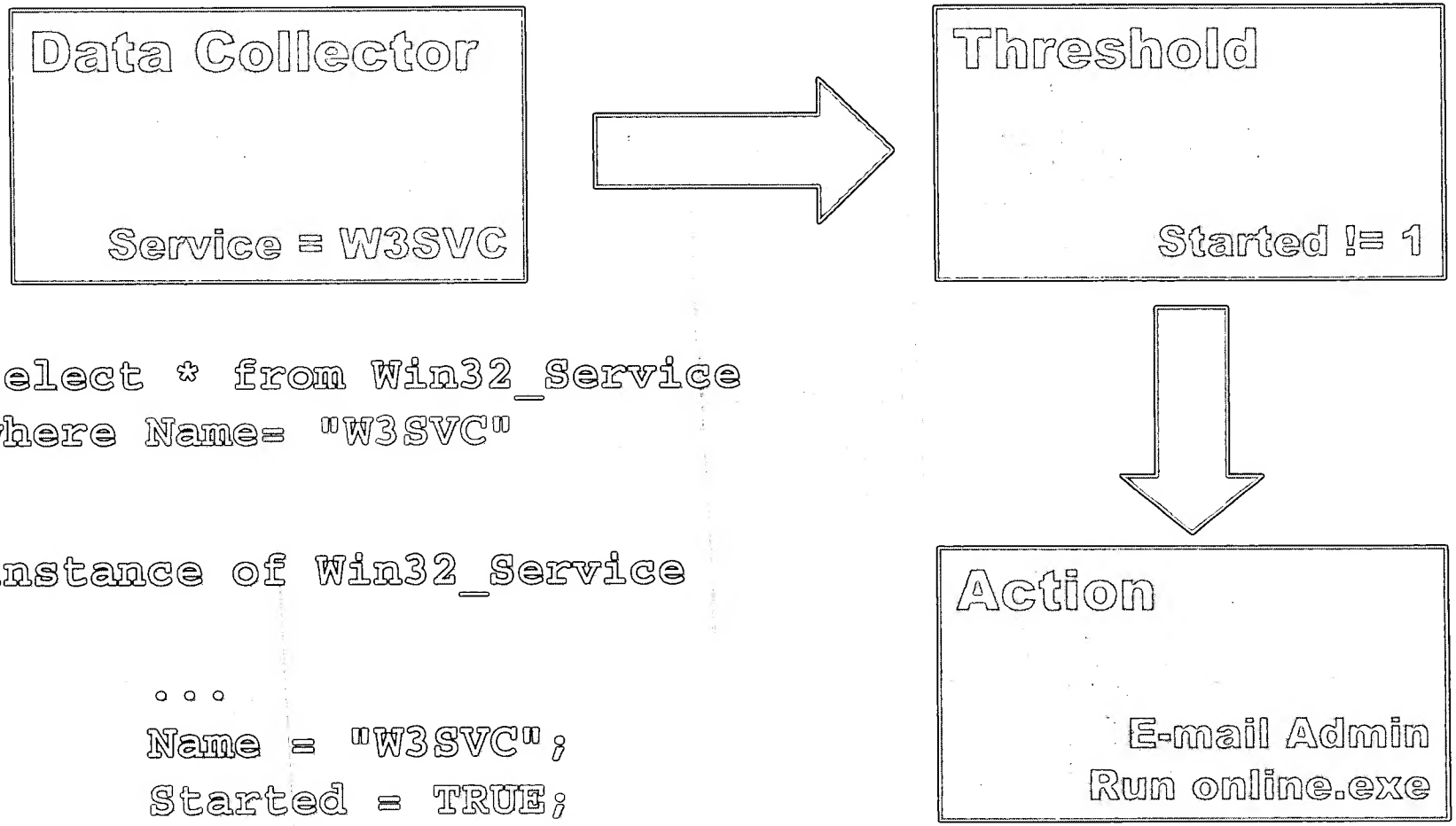
isa – registration applies to all events from class (incl. derived classes)

within XXX (within group by clause) – specifies aggregation interval

```
select * from __InstanceModificationEvent within 5
where TargetInstance isa Win32_LogicalDisk
group by DriveLetter
within 10 having count > 25
```

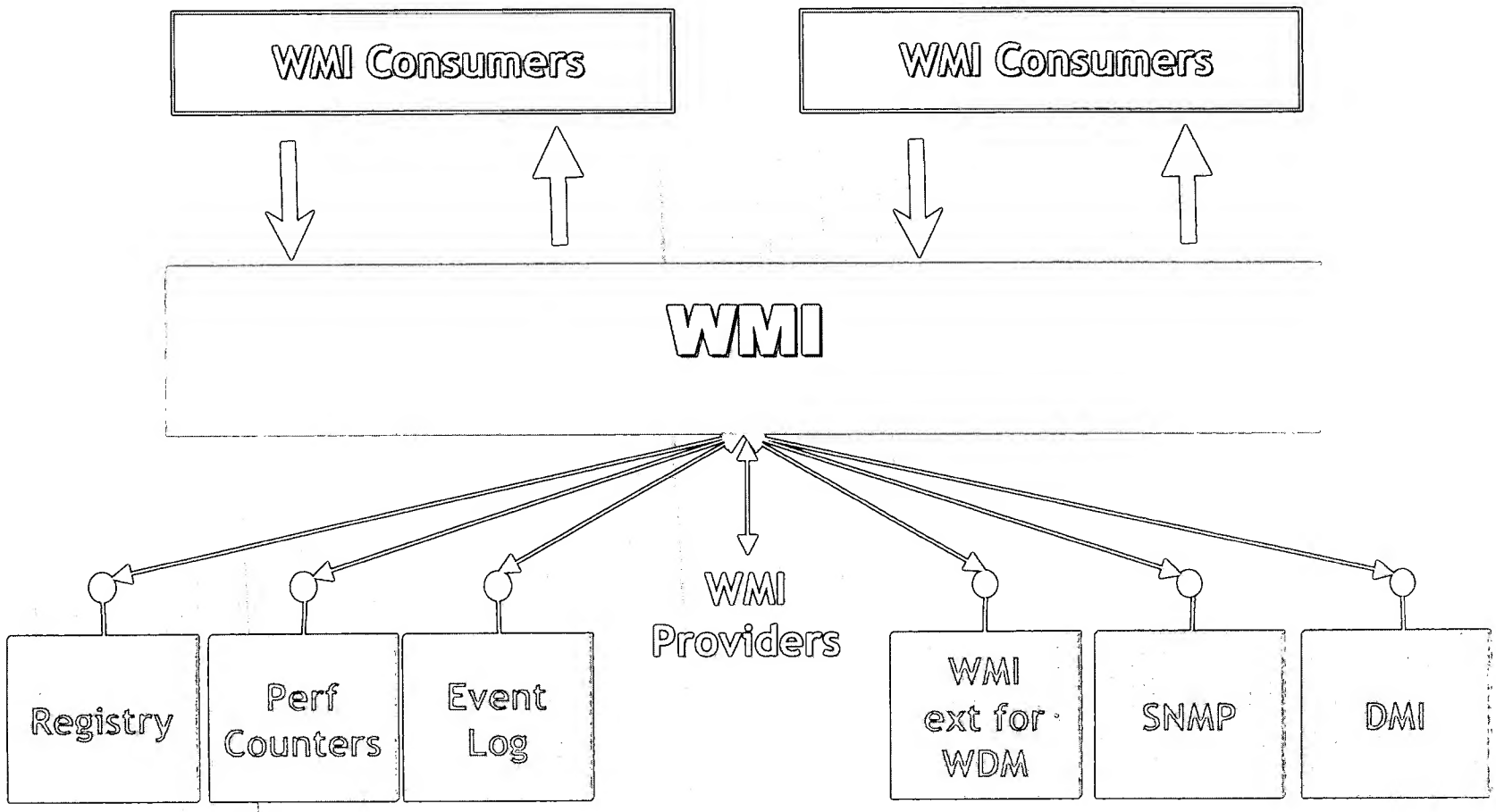
Tip: use wbemtest or CIM Studio

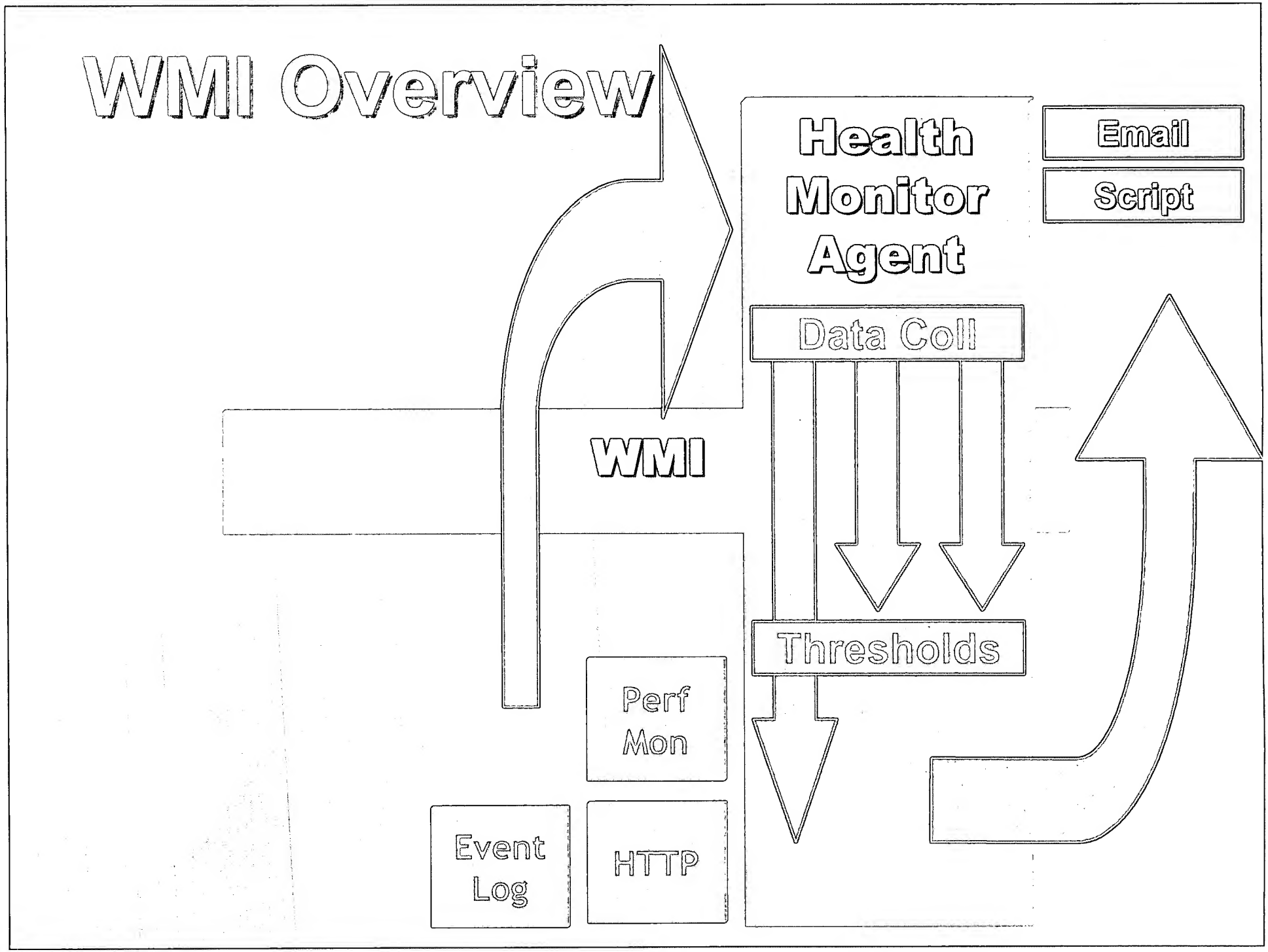
Health Monitor Data Flow



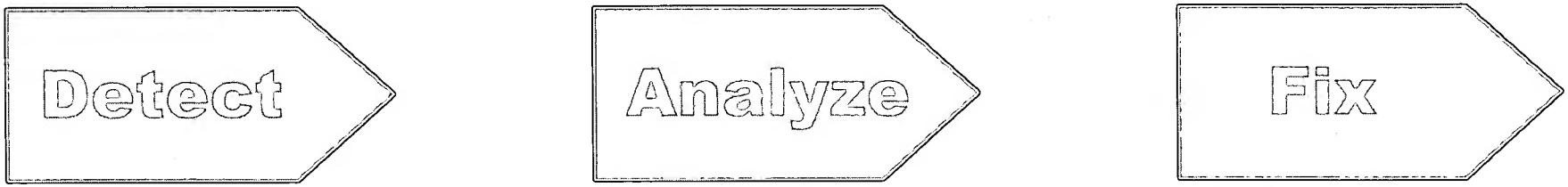

```
Select * from Win32_Service
where Name= "W3SVC"


instance of Win32_Service
{
        ...
        Name = "W3SVC";
        Started = TRUE;
        State = "Running";
        ...
};
```

WMI Overview



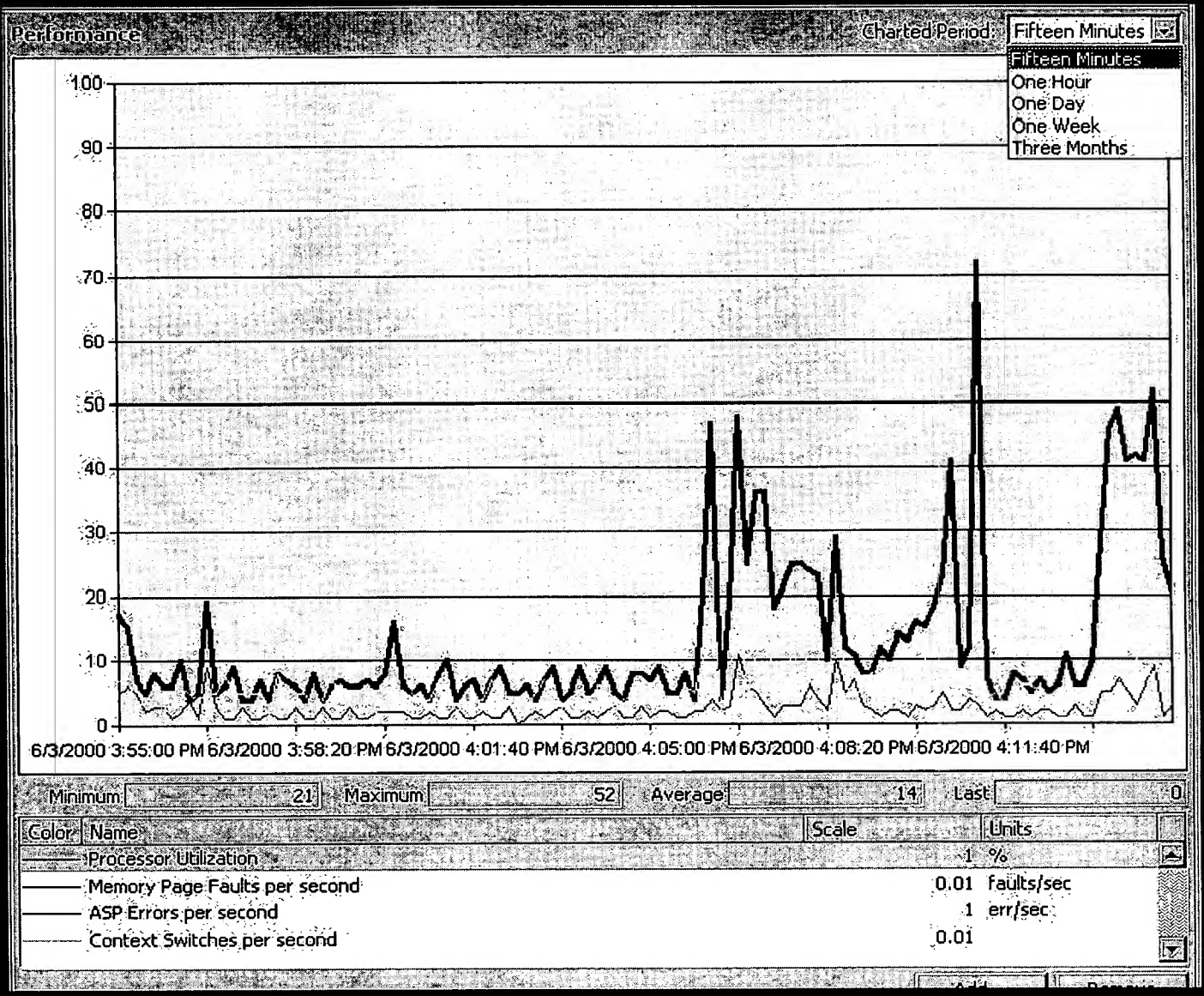

WMI Overview
Health Monitor Agent
Email
Script
Data Coll
WMI
Thresholds
Perf Mon
Event Log
HTTP

Demo: System Health

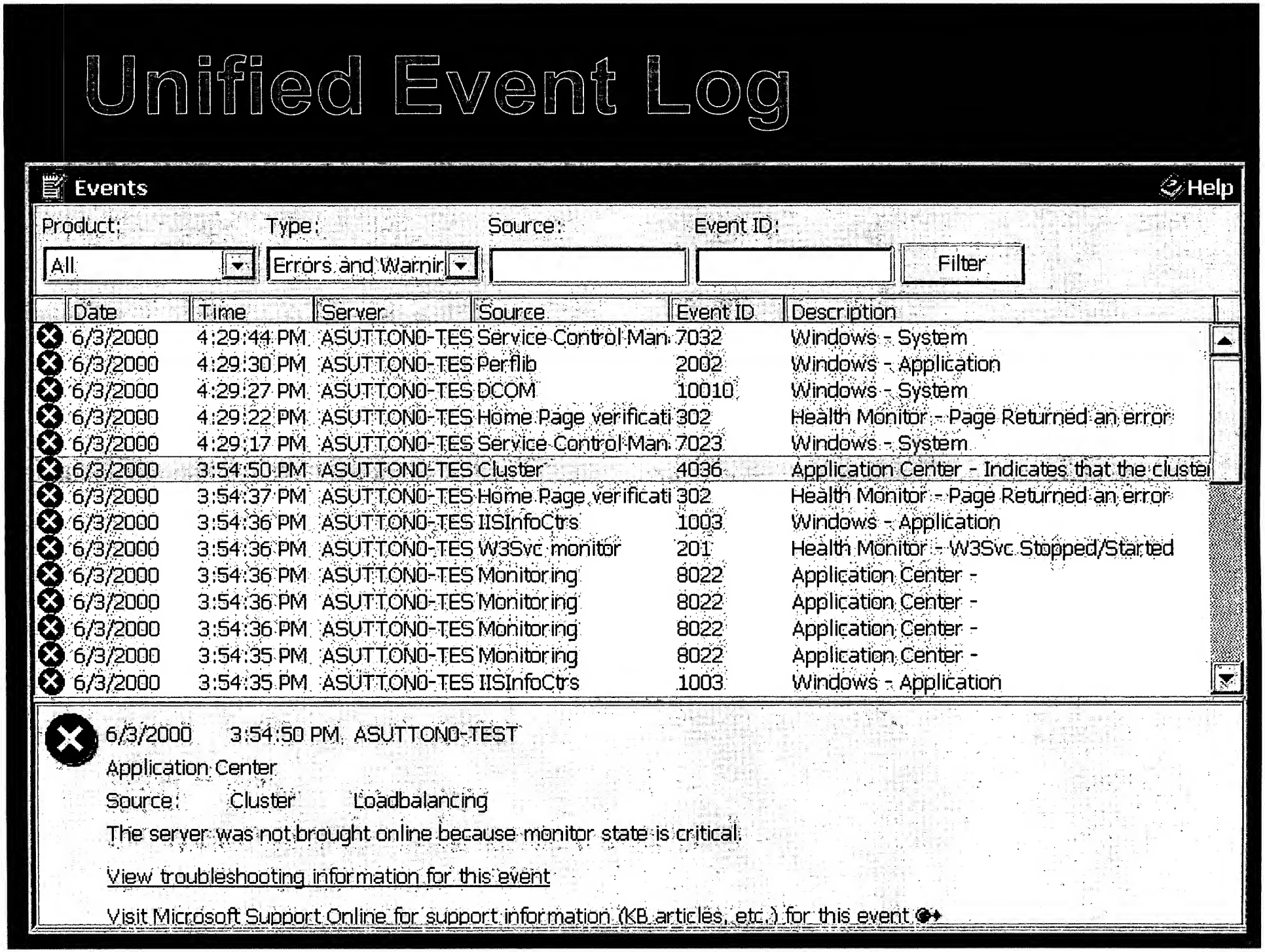


- Monitor for CPU spikes
- Generate CPU load
- Application Center Perf Viewer
- Application Center Event Viewer
- Application Center Monitor Viewer

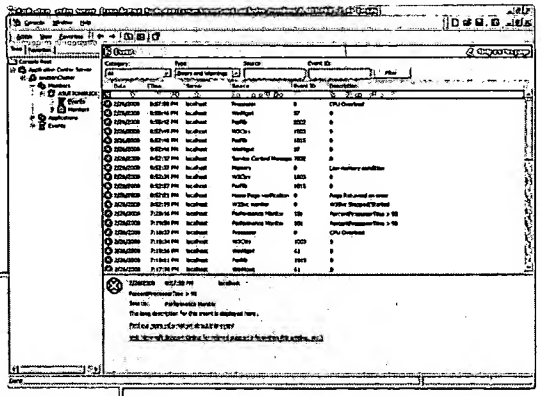
Performance Counters

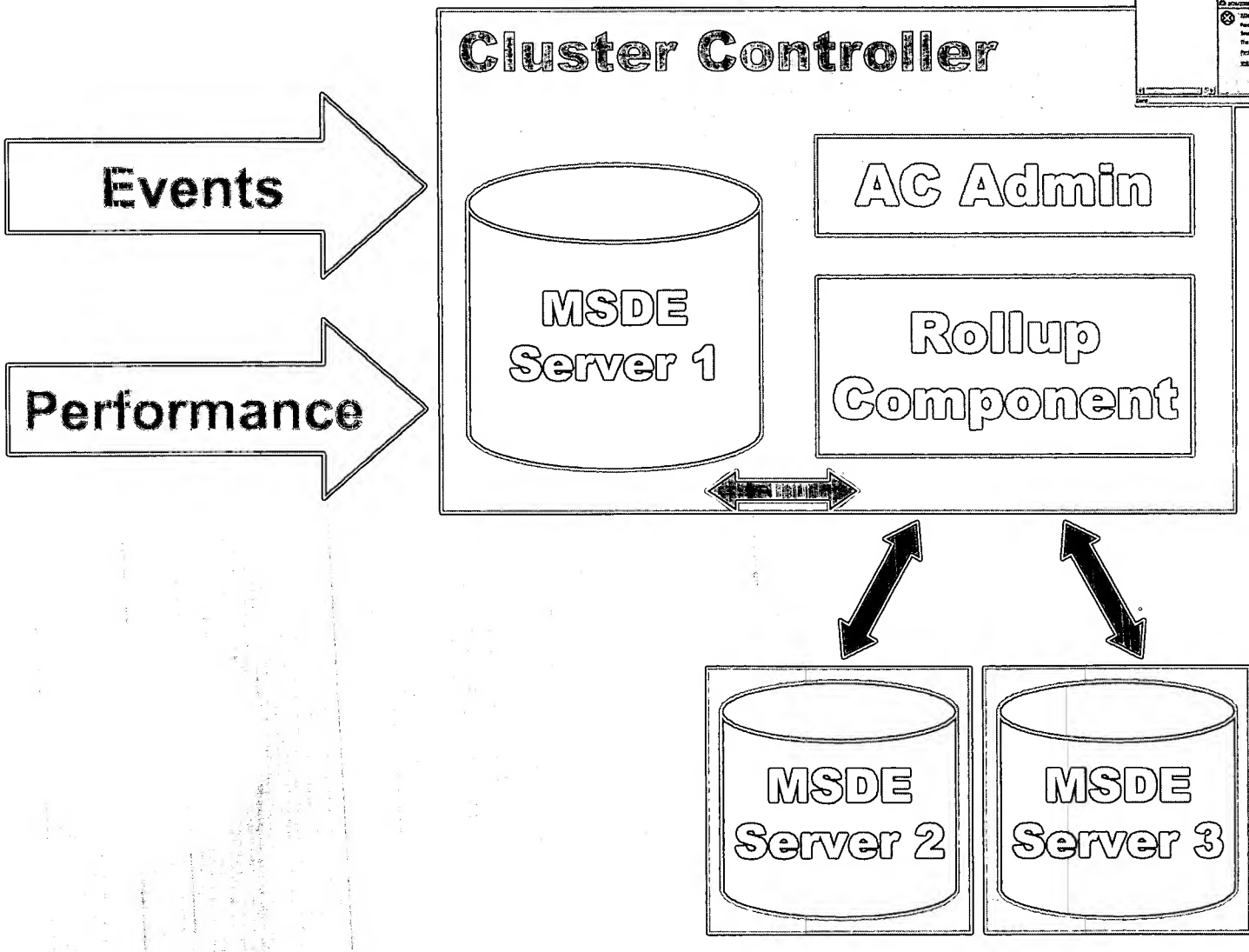


Unified Event Log

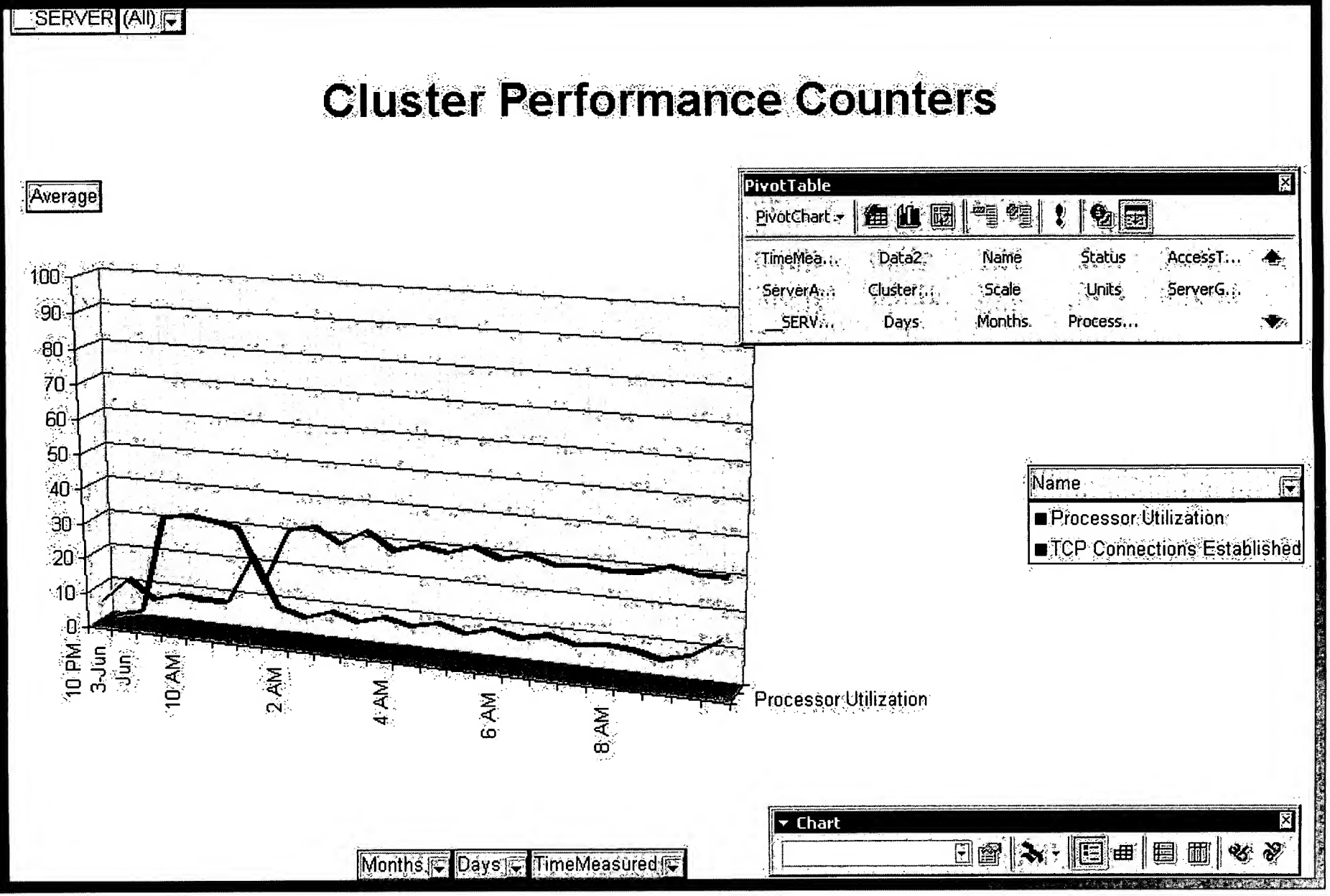


Cluster-Wide View





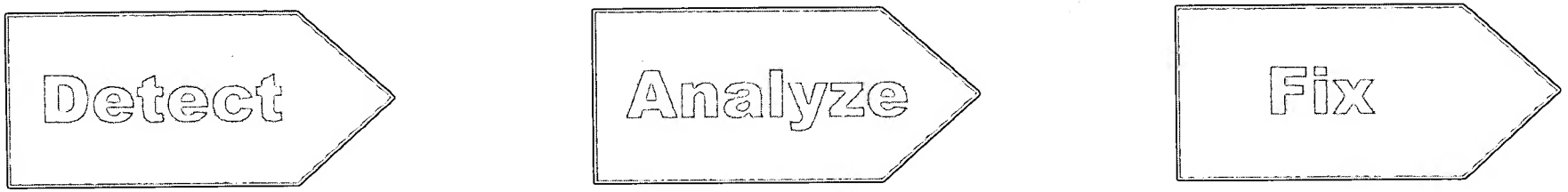
Log Access Possibilities



Monitoring Extensibility

- Application Center WMI Provider
- Extract Application Center logs
- Query and reporting tools
- 3rd party monitoring tools
- WMI event consumer

Demo: Application Availability



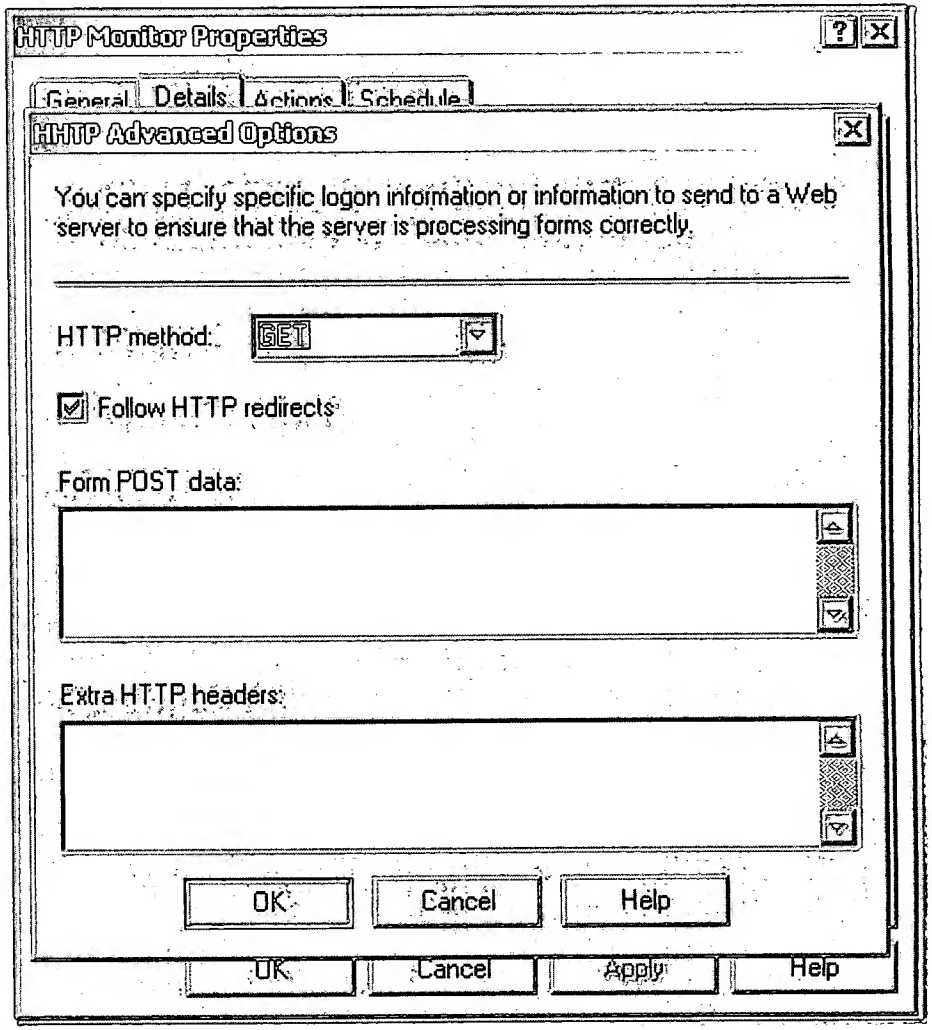
- ❑ Create HTTP Monitor
- ❑ Web Service Monitor
- ❑ Associate Action
- ❑ Stop web service on member
- ❑ Monitors fail and state goes critical
- ❑ Action takes server offline
- ❑ E-mail admin and alert in event log

Application Availability

- Monitors can control load balancing
  - If monitor fails, server goes offline
  - Default Application Center rule
- Scriptable to extend behavior
- Beware taking all servers offline
  - Redirect page if database error
  - Or custom scripts

Web Page Monitors

- URL
- Timeout
- Authentication
- HTTP Method
- Post Data
- Custom Headers



Web Page Monitors

- Response Properties
  - Status code, response time, last modified
  - Text response, binary response, headers
  - Content length, received bytes
- Actions
  - Take offline
  - Redirect to a different page
  - Check other monitors
  - Run a script

Database Monitors

- Database health
  - Performance Counters and Events
  - SQL DMO Provider
- Connectivity to the server
  - TCP/IP port connect
- Successful query
  - ASP page

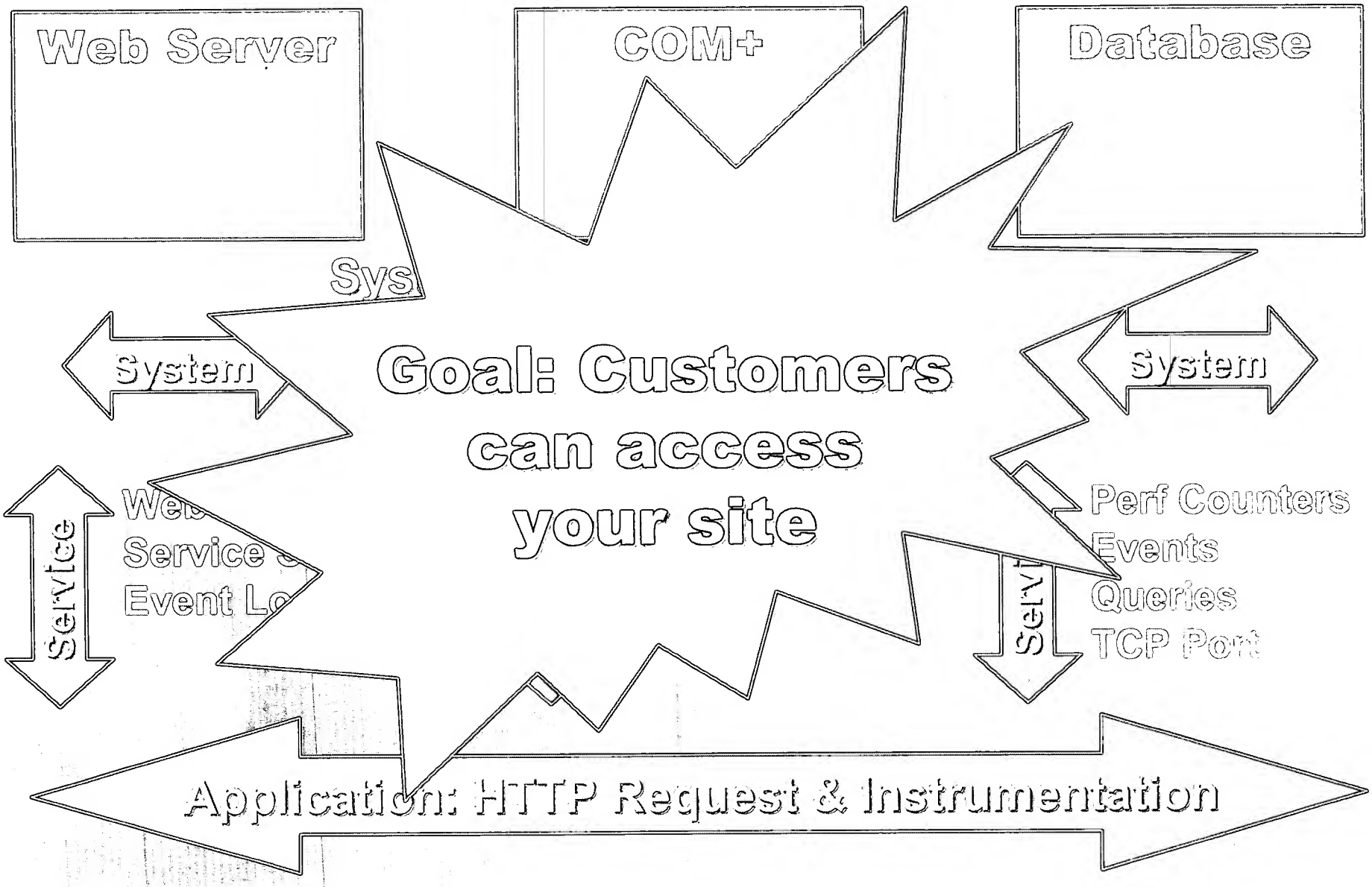
Database Monitoring Script

- Demo ASP database monitor

COM+ Statistics Provider

- Execution metrics
  - Total committed transactions and per sec
  - Total aborted transactions and per sec
  - Total object creations and per sec
  - Total object activations and per sec
  - Shutdowns: total, timeout, admin, failure
  - Object pool timeouts
- Win32_Process statistics (dllhost.exe)
  - Handles, working set, page faults, processor time...

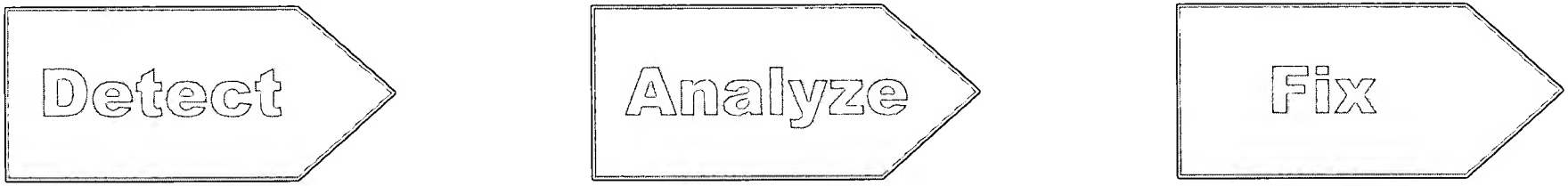
Monitoring Health



Application Center Monitoring

- Health Monitor Integration
  - Monitoring samples
  - Load balancing control
  - Replication of monitors and time
  - Operators view
- Cluster-wide event log
- Cluster-wide performance counters

Best Practices



- Instrumentation
  - HTTP, ping and port connect monitors
  - PerfMon and Event Log
  - WMI Provider
- Monitor application health
  - What does availability mean to you?
  - Baseline performance
  - Watch out for false positives

Call to Action

- Install Application Center Beta 1 !
- Monitor and instrument your applications
- Develop an operations plan
- Understand WMI

Related Sessions And References

- Other PDC sessions recommended
  - *Load-Balancing .NET Platform Applications with Application Center 2000*
    (2-315, Room 311, 9/12/00, 2:45 p.m. Ori Amiga)
  - *Using WMI to Build Management into .NET Platform Applications*
    (3-344, Room 304, 9/12/00, 2:45 p.m. Corina Feuerstein; Travis Muhlestein; Stephen Todd)
  - *Scaling out the Data Tier with Shared Nothing Clustering Technology in SQL Server 2000 and Beyond*
    (2-328, Room 109, 9/13/00, 5:30 p.m., Pedro Celis)
- References
  - http://www.microsoft.com/applicationcenter
  - WMI Reference: Platform SDK, Management Services

Where do you want to go today?

Microsoft

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